United States
Environmental Protection Agency

Air and Radiation
Global Programs Division
6205J

Substitutes in Non-Aerosol Solvent Cleaning Under SNAP as of August 21, 2003

SNAP Information: http://www.epa.gov/ozone/snap

EPA has created the Significant New Alternatives Policy (SNAP) Program under section 612 of the Clean Air Act Amendments. SNAP evaluates alternatives to ozone-depleting substances. Substitutes are reviewed on the basis of ozone depletion potential, global warming potential, toxicity, flammability, and exposure potential as described in the March 18, 1994 final SNAP rule (59 FR 13044). Lists of acceptable and unacceptable substitutes will be updated periodically in the Federal Register. The following SNAP notices and subsequent final rules are included in this list: August 26, 1994 (59 FR 44240), January 13, 1995 (60 FR 3318), June 13, 1995 (60 FR 31092), July 28, 1995 (60 FR 38729), February 8, 1996 (61 FR 4736), May 22, 1996 (61 FR 25585), September 5, 1996 (61 FR 47012), October 16, 1996 (61 FR 54030), March 10, 1997 (62 FR 10700), June 3, 1997 (62 FR 30275), February 24, 1998 (63 FR 9151), May 22, 1998 (63 FR 28251), January 26, 1999 (64 FR 3861), April 28, 1999 (64 FR 22981), June 8, 1999 (64 FR 30410), December 6, 1999 (64 FR 68039), April 11, 2000 (65 FR 19327), June 19, 2000 (65 FR 37900), December 18, 2000 (65 FR 78977), December 20, 2003 (67 FR 77927), and August 21, 2003 (68 FR 50533).

Substitutes for ELECTRONICS Cleaning under the Significant New Alternatives Policy (SNAP) Program as of August 21, 2003

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Semi-aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Straight organic solvent cleaning (with terpenes, C5-C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.)	CFC-113, MCF	Acceptable	None	OSHA standards must be met, if applicable.
Trichloroethylene, perchloroethylene, methylene chloride	CFC-113, MCF	Acceptable	None	OSHA and RCRA standards must be met. EPA issued Maximum Achievable Control Technology requirements under the Clean Air Act for vapor degreasing in November 1994.
No-clean alternatives	CFC-113, MCF	Acceptable	None	Substitutes found acceptable include low solids fluxes and inert gas soldering.

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Supercritical fluids, plasma cleaning, UV / Ozone cleaning	CFC-113, MCF	Acceptable	None	OSHA standards for ozone must be met.
Volatile methyl siloxanes	CFC-113, MCF	Acceptable	None	Approval is granted for the whole class of compounds.
Trans-1,2-dichloroethylene	CFC-113, MCF	Acceptable	None	The OSHA set exposure limit is 200 ppm.
Hydrofluorether (HFE)7100: C4F9OCH3 (methoxynonafluorobutane, iso and normal)	CFC-113, MCF, HCFC-141b, HCFC-22	Acceptable	None	None
HFE-7200 (C5F9OCH3)	CFC-113, MCF	Acceptable	None	The Agency expects that any exposures will not exceed any acceptable exposure limits set by any voluntary consensus standards organization, including the American Conference of Governmental Industrial Hygienists' (ACGIH) threshold limit values (TLVs) or the American Industrial Hygiene Association's (AIHA) workplace environmental exposure limits (WEELs).
Heptafluorocyclopentane	CFC-113, MCF, HCFC-141b	Acceptable	None	EPA expects users to adhere to an exposure limit of 123 ppm over an eight-hour time-weighted average, with a ceiling of 500 ppm.
HFC-365mfc	CFC-113, MCF, HCFC-141b	Acceptable	None	None
HFE-7000	CFC-113, MCF	Acceptable	None	EPA expects that the workplace environmental exposure will not exceed the workplace exposure limit of 75 ppm and that users will observe the manufacturer's recommendations in MSDSs.
Perfluorocarbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16)	CFC-113, MCF	Acceptable subject to narrowed use limits	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file.

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Perfluoropolyethers	CFC-113, MCF	Acceptable subject to narrowed use limits	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	PFPEs have similar global warming profiles to the PFCs, and the SNAP decision on PFPEs parallels that for PFCs.
Monochlorotoluenes and benzotrifluorides	CFC-113, MCF	Acceptable subject to use conditions	Subject to a 50 ppm workplace standard for monochlorotoluenes and a 100 ppm standard for benzotrifluoride.	The workplace standard for monochlorotoluenes is based on an OSHA PEL of 50 ppm for orthochlorotoluene. The workplace standard for benzotrifluorides is based on the company-set acceptable exposure limit.
HFC-4310mee	CFC-113, MCF, HCFC-141b	Acceptable subject to use conditions	Subject to a 200 ppm time-weighted average workplace exposure standard and 400 ppm workplace exposure ceiling.	None
HCFC-225ca / cb	CFC-113, MCF	Acceptable subject to use conditions	Subject to the company-set exposure limit of 25 ppm for the -ca isomer.	HCFC-225ca/cb is offered as an isomeric blend. The company-set workplace standard for the ca-isomer is 25 ppm and for the cb isomer 250ppm. Those of the less toxic cb-isomer suggests that the 25 ppm standard for the blend can be readily met.
Dibromomethane	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
HCFC 141b and its blends	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
Chlorobromomethane	CFC-113, MCF, HCFC-141b	Unacceptable	N/A	High ODP; other alternatives exist.

Substitutes for METALS Cleaning under the Significant New Alternatives Policy (SNAP) Program as of August 25, 2003

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Semi-aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Straight organic solvent cleaning (with terpenes, C5-C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.)	CFC-113, MCF	Acceptable	None	OSHA standards must be met, if applicable.
Trichloroethylene, perchloroethylene, methylene chloride	CFC-113, MCF	Acceptable	None	OSHA and RCRA standards must be met. EPA issued Maximum Achievable Control Technology requirements under the Clean Air Act for vapor degreasing in November 1994.
Vanishing oils	CFC-113, MCF	Acceptable	None	Depending on geographic region, may be subject to VOC controls.
Supercritical fluids	CFC-113, MCF	Acceptable	None	None
Volatile methyl siloxanes	CFC-113, MCF	Acceptable	None	Approval is granted for the whole class of compounds.
Trans-1,2-dichloroethylene	CFC-113, MCF	Acceptable	None	The OSHA set exposure limit is 200 ppm.
HFC-4310mee	CFC-113, MCF HCFC-141b	Acceptable	None	Company-set time-weighted average workplace exposure standard of 200 ppm, and a workplace exposure ceiling of 400 ppm.
Hydrofluorether (HFE)7100: C4F9OCH3 (methoxynonafluorobutane, iso and normal)	CFC-113, MCF, HCFC-141b, HCFC-22	Acceptable	None	None
HFE-7200 (C5F9OCH3)	CFC-113, MCF	Acceptable	None	The Agency expects that any exposures will not exceed any acceptable exposure limits set by any voluntary consensus standards organization, including the American Conference of Governmental Industrial Hygienists' (ACGIH) threshold limit values (TLVs) or the American Industrial Hygiene Association's (AIHA) workplace environmental exposure limits (WEELs).

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Heptafluorocyclopentane	CFC-113, MCF, HCFC-141b	Acceptable	None	EPA expects users to adhere to an exposure limit of 123 ppm over an eight-hour time-weighted average, with a ceiling of 500 ppm.
HFC-365mfc	CFC-113, MCF, HCFC-141b	Acceptable	None	None
HCFC-225ca and HCFC-225cb	CFC-113, MCF	Acceptable	None	EPA recommends observing the manufacturer's recommended exposure guidelines of 50 ppm for the -ca isomer, 400 ppm for the -cb isomer, and 100 ppm for the commercial mixture of HCFC-225ca/cb. EPA encourages users to consider other alternatives that do not have an ozone depletion potential.
Monochlorotoluenes and benzotrifluorides	CFC-113, MCF	Acceptable subject to use conditions	Subject to a 50 ppm workplace standard for monochlorotoluenes and a 100 ppm standard for benzotrifluoride.	The workplace standard for monochlorotoluenes is based on an OSHA PEL of 50 ppm for orthochlorotoluene. The workplace standard for benzotrifluorides is based on the company-set acceptable exposure limit.
Dibromomethane	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
HCFC 141b and its blends	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
Chlorobromomethane	CFC-113, MCF, HCFC-141b	Unacceptable	N/A	High ODP; other alternatives exist.

Substitutes for PRECISION Cleaning under the Significant New Alternatives Policy (SNAP) Program as of August 25, 2003

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Semi-aqueous cleaners	CFC-113, MCF	Acceptable	None	EPA is planning to issue effluent guidelines for this industry under the Clean Water Act.
Straight organic solvent cleaning (with terpenes, C5-C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.)	CFC-113, MCF	Acceptable	None	OSHA standards must be met, if applicable.
Trichloroethylene, perchloroethylene, methylene chloride	CFC-113, MCF	Acceptable	None	OSHA and RCRA standards must be met. EPA issued Maximum Achievable Control Technology requirements under the Clean Air Act for vapor degreasing in November 1994.
Supercritical fluids, plasma cleaning, UV/Ozone cleaning	CFC-113, MCF	Acceptable	None	OSHA standards for ozone must be met.
HCFC-123	CFC-113, MCF	Acceptable	None	Has an AEL of 30ppm.
Trans-1,2-dichloroethylene	CFC-113, MCF	Acceptable	None	The OSHA set exposure limit is 200 ppm.
Hydrofluorether (HFE) 7100: C4F9OCH3 (methoxynonafluorobutane, iso and normal)	CFC-113, MCF, HCFC 141b	Acceptable	None	None
HFE-7200 (C5F9OCH3)	CFC-113, MCF	Acceptable	None	The Agency expects that any exposures will not exceed any acceptable exposure limits set by any voluntary consensus standards organization, including the American Conference of Governmental Industrial Hygienists' (ACGIH) threshold limit values (TLVs) or the American Industrial Hygiene Association's (AIHA) workplace environmental exposure limits (WEELs).
Heptafluorocyclopentane	CFC-113, MCF, HCFC-141b	Acceptable	None	EPA expects users to adhere to an exposure limit of 123 ppm over an eight-hour time-weighted average, with a ceiling of 500 ppm.
HFC-365mfc	CFC-113, MCF, HCFC-141b	Acceptable	None	None

Substitute	ODS Being Replaced	Decision	Conditions or Restrictions	Comments
Volatile methyl siloxanes	CFC-113, MCF	Acceptable	None	Approval is granted for the whole class of compounds.
HFE-7000	CFC-113, MCF	Acceptable	None	EPA expects that the workplace environmental exposure will not exceed the workplace exposure limit of 75 ppm and that users will observe the manufacturer's recommendations in MSDSs.
Monochlorotoluenes and benzotrifluorides	CFC-113, MCF	Acceptable subject to use conditions	Subject to a 50 ppm workplace standard for monochlorotoluenes and a 100 ppm standard for benzotrifluoride.	The workplace standard for monochlorotoluenes is based on an OSHA PEL of 50 ppm for orthochlorotoluene. The workplace standard for benzotrifluorides is based on the company-set acceptable exposure limit.
HFC-4310mee	CFC-113, MCF, HCFC-141b	Acceptable subject to use conditions	Subject to a 200 ppm time-weighted average workplace exposure standard and 400 ppm workplace exposure ceiling.	None
HCFC-225ca / cb	CFC-113, MCF	Acceptable subject to use conditions	Subject to the company-set exposure limit of 25 ppm for the -ca isomer.	HCFC-225ca/cb is offered as an isomeric blend. The company-set workplace standard for the ca-isomer is 25 ppm and for the cb isomer 250ppm. Those of the less toxic cb-isomer suggests that the 25 ppm standard for the blend can be readily met.
Perfluorocarbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16)	CFC-113, MCF	Acceptable subject to narrowed use limits	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file.
Perfluoropolyethers	CFC-113, MCF	Acceptable subject to narrowed use limits	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	PFPEs have similar global warming profiles to the PFCs, and the SNAP decision on PFPEs parallels that for PFCs.
Dibromomethane	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
HCFC 141b and its blends	CFC-113, MCF	Unacceptable	N/A	High ODP; other alternatives exist.
Chlorobromomethane	CFC-113, MCF, HCFC-141b	Unacceptable	N/A	High ODP; other alternatives exist.